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Examiner Name	Kimberly N. McLean-Mayo
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ENCLOSURES (*Check all that apply*)

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(1) Appeal Brief (Amended)

(2) Return Receipt Postcard

Remarks

The enclosed Appeal Brief (Amended) is submitted in response to the Notification of Non-Complaint Appeal Brief mailed December 5, 2006.

If the enclosed papers are considered incomplete, the Mail Room is respectfully requested to contact the undersigned at (617) 646-8000, Boston, Massachusetts.

If a fee is required for this submission, please charge the balance to the account of the undersigned, Deposit Account No. 23/2825.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	WOLF, GREENFIELD & SACKS, P.C.		
Signature			
Printed name	Richard F. Giunta		
Date	January 5, 2007	Reg. No.	36,149

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Dated: January 5, 2007

Richard F. Giunta, Reg. No. 36,149

ATTORNEY'S DOCKET NO: E0295.70021US00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Wilson et al.
Serial No:	08/935844
Conf. No.	9098
Filed:	September 23, 1997
For:	METHOD AND APPARATUS FOR IMPLEMENTING A REMOTE MIRRORING DATA FACILITY
Examiner:	Kimberly N. McLean-Mayo
Art Unit:	2751 (Technology Center 2100)

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APPEAL BRIEF (AMENDED)

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This brief is in furtherance of the Notice of Appeal filed on February 5, 2002, and the Notification of Non-Complaint Appeal Brief mailed December 5, 2006.

The fees associated with the filing of an Appeal Brief were paid with the original Appeal Brief submitted May 1, 2002. Accordingly, no fee is believed due. If a fee is required for this submission, please charge said fee to the account of the undersigned, Deposit Account No. 23/2825.

I. REAL PARTY IN INTEREST (37 C.F.R. §41.37(c)(1)(i))

The real party in interest in this application is the assignee, EMC Corporation (hereafter "EMC"), a Massachusetts corporation having a place of business at 176 South Street, Hopkinton, MA 01748.

II. RELATED APPEALS AND INTERFERENCES (37 C.F.R. §41.37(c)(1)(ii))

There are no other appeals or interferences known to the Appellants, the Appellants' legal representative, or the assignee which will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS (37 C.F.R. §41.37(c)(1)(iii))

There are 65 total claims in this application (13 independent claims and 52 dependent claims). The appealed claims are set forth in Appendix A. The following summarizes the status of the claims:

1. Claims pending and appealed: 1-32, 34-60, 62-63 and 65-67
2. Claims rejected: 1-32, 34-60, 62-63 and 65-67
3. Claims allowed: none
4. Claims withdrawn from consideration: none
5. Claims canceled: 33, 61 and 64

IV. STATUS OF AMENDMENTS (37 C.F.R. §41.37(c)(1)(iv))

No amendments have been filed subsequent to the final Office Action of November 5, 2001.

V. SUMMARY OF CLAIMED SUBJECT MATTER (37 C.F.R. §41.37(c)(1)(v))

Embodiments of the present invention relate to remote mirroring data facilities, an example of which is shown in Fig. 1 of the application. In a remote mirroring data facility, the data for a host CPU (e.g., host CPU 1 in Fig. 1) is stored to a local storage device (e.g., source storage device 3 in Fig. 1), but is also mirrored (i.e., copied) to a remote location (e.g., target storage device 9) to ensure that the stored data is not lost if a catastrophic event (e.g., a natural disaster, a fire, etc.) results in destruction of the main storage device.

In a conventional remote data facility of the type shown in Fig. 1[1], intelligent storage systems are employed on both the source and target ends. Thus, the storage controller and storage device pairs shown in Fig. 1 are provided in an intelligent storage system, such as a storage system from the SYMMETRIX line of storage systems available from EMC, the assignee of the present application. The storage controllers on the source and target sides automatically control the mirroring of data from the source storage device to the target storage device. Thus, the mirroring can be performed in a manner that is transparent to the host CPU 1 (Fig. 1), and without employing the resources of the host CPU 1 to do writes to multiple locations. That is, the host CPU simply writes data to the source storage system, and the mirroring (i.e., copying) of that data to the target storage system is done in a manner transparent to the host CPU.

It should be appreciated that the intelligent storage systems employed in conventional remote mirroring data facilities are not general purpose computers, but rather, are storage systems that most typically only communicate with one or more host devices for which they

[1] This type of remote mirroring data facility is also described in commonly assigned U.S. Patents Nos. 5,544,347 (Yanai) and 5,960,216 (Vishlitzky), both which are relied upon in rejecting at least some of the claims on appeal.

store data. Thus, when remote mirroring data facilities were first implemented, a technique and protocol needed to be developed to enable direct communication between the source and target storage systems. As discussed in the background of the present application at page 2, ESCON (a standard computer system interface and protocol developed by IBM) was initially adopted by EMC as the protocol for communication between the source and target storage systems, because ESCON was a protocol that the storage systems already supported for communication with their local host CPUs. However, one downside of the ESCON protocol was that it required a dedicated ESCON link to couple the source and target storage systems, which was disadvantageous in that it was costly to implement, and also placed limitations on the maximum supported distance for the link (specification, page 2, lines 24-29).

To address these limitations, EMC developed techniques for implementing the dedicated link between the source and target systems through pre-existing public communication channels, such as leased T1 or T3 lines. (specification, page 3).

Prior to Appellants' invention, it was generally understood in the art that the dedicated link between the source and target storage systems needed to be a high performance communication link. See e.g., Yanai at col. 5, line 53; and U.S. Patent No. 5,835,953 (Ohran), also of record, which refers (at col. 3, line 53 – col. 4, line 67) to a remote data facility as "disk mirroring". Ohran states:

> if disk mirroring is to be made to a remote site, the amount of data transferred to the remote site can be considerable. Thus a high speed communication link must exist between the primary site and the secondary or backup site. (col. 4, line 37).

In addition to the significant amount of data transfer highlighted by Ohran, high speed links were also believed to be necessary because many remote mirroring data facilities are capable of operating in a real-time or synchronous mode, wherein an I/O operation from the host computer cannot complete until the data is stored not only on its local source storage system, but also on the remote target storage system. (see e.g., Yanai at col. 6, lines 20-25). Thus, for a remote mirroring data facility where there is any substantial distance between the target and source

locations, it was believed to be critical to the performance of the host to employ a high speed link.

Appellants appreciated that some user applications for a remote mirroring data facility may not require the performance generally provided by a high speed dedicated communication link, and might benefit from a more inexpensive solution to implementing the link between the source and target storage systems in a remote mirroring data facility. (specification, page 4, lines 1-4).

In view of the foregoing, one aspect of the present invention is directed to a method and apparatus for implementing a link between two remotely disposed storage systems in a mirroring data facility over a pre-existing and less expensive data communication link. In one embodiment, the link is implemented using a network cloud that is not exclusively dedicated to the remote mirroring data facility. In another embodiment, the link is wireless.

In one aspect of the present invention, multiple connections are provided between the network cloud and the source and/or target storage system, so that improved performance can be achieved by sending information through the network cloud in parallel (specification, page 11, lines 3-15).

In another aspect, a broadcast feature can be employed to implement a remote mirroring data facility having two target storage systems each connected to the network cloud to enable multiple mirrors to be provided without significant additional costs in implementing the links to multiple locations. (specification, page 14, lines 11-23).

The foregoing summary of the invention is provided merely to assist the Board in appreciating various aspects of the present invention. However, this summary does not apply to each of the independent claims on appeal, and the language of the independent claims may differ in material respects from the summary provided above. Thus, the Board is respectfully requested to give careful consideration to the language of each of the independent claims and to address each on its own merits, without relying on the summary provided above. In this respect, Appellants do not rely on the summary provided above to distinguish any of the claims of the present invention over the prior art, but rather, rely only upon the arguments provided below.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. §41.37(c)(1)(vi))

1. Whether claims 1-3, 5, 10-12, 18-19, 39-41, 46-49 and 51-52[2] are obvious under 35 U.S.C. § 103 over U.S. Patent No. 5,991,813 (Zarrow) in view of U.S. Patent No. 5,544,537 (Yanai).
2. Whether claims 4 and 17 are obvious under 35 U.S.C. § 103 over Zarrow in view of Yanai and further in view of the article by Black entitled "Computer Networks: Protocols, Standards and Interfaces", second edition, 1993 (hereafter "Black").
3. Whether claims 6-8, 15-16, 20-21, 42-44 and 50 are obvious under 35 U.S.C. § 103 over Zarrow in view of Yanai and U.S. Patent No. 5,960,216 (Vishlitzky).
4. Whether claims 9 and 14 are obvious under 35 U.S.C. § 103 over Zarrow in view of Yanai and U.S. Patent No. 5,212,784 (Sparks).
5. Whether claims 13 and 45 are obvious under 35 U.S.C. § 103 over Zarrow in view of Yanai and Sparks[3].
6. Whether claims 22-30 and 53-55 are obvious under 35 U.S.C. § 103 over Zarrow in view of Sparks and Yanai.
7. Whether claims 31-32 and 35-38 are obvious under 35 U.S.C. §103 over Zarrow in view of Sparks and Yanai.

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[2] Claims 3, 18, 41 and 49 are not listed in the rejection on page 2 of the final Office Action, but they are discussed in the substance of the rejection at page 4 of the final Office Action. Conversely, while claim 61 is listed on page 2 as one of the rejected claims, claim 61 was previously cancelled.

[3] While Issues 4 and 5 both relate to rejections over Zarrow in view of Yanai and Sparks, these rejections (as recognized in the final Office Action) raise different issues as different sections of Sparks are relied upon.

8. Whether claim 34 is obvious under 35 U.S.C. §103 as being obvious over Zarrow in view of Yanai[4], Sparks and Black.
9. Whether claims 56-58 are obvious under 35 U.S.C. §103 as being obvious over Zarrow in view of Yanai and U.S. Patent No. 5,537,533 (Staheli).
10. Whether claims 59-60 are obvious under 35 U.S.C. §103 as being obvious over Zarrow in view of Yanai and Black.
11. Whether claims 62-63 and 65-67[5] are obvious under 35 U.S.C. §103 over Zarrow in view of Yanai and Vishlitzky.

VII. ARGUMENT (37 C.F.R. §41.37(c)(1)(vii))

1. Claims 1-3, 5, 10-12, 18-19, 39-41, 46-49, 51-52 and 61 Are Not Obvious Under §103 Over Zarrow in View of Yanai

Each of the above-listed claims (including independent claims 1, 37, 39, 47 and 61) is directed to an aspect of the present invention wherein mirroring communication is performed between two storage systems through a communication link including a network cloud. It is respectfully asserted that no prima facie case of obviousness has been established with respect to these claims, as the combination of Zarrow and Yanai does not teach this aspect of the present invention. Before turning to the specific language in the claims, a summary will be provided of the teachings of Zarrow and Yanai, and an explanation will be provided of the type of system that one of ordinary skill in the art would have been led to by following these teachings.

[4] While the rejection at page 11 does not recite Yanai as part of the combination, it refers to the rejection of Zarrow and Sparks as applied to claim 31 (from which claim 34 depends). The rejection of claim 31 includes Yanai in the combination.

[5] While claim 64 is listed as one of the rejected claims, claim 64 was previously canceled.

A. Zarrow

Zarrow is directed to host-based mirroring, wherein the host computer performs multiple writes to perform a mirroring operation, and is specifically directed to solving the problem of remote access to a storage device using the Small Computer Systems Interface (SCSI) protocol. Fig. 1 of Zarrow is reproduced below.

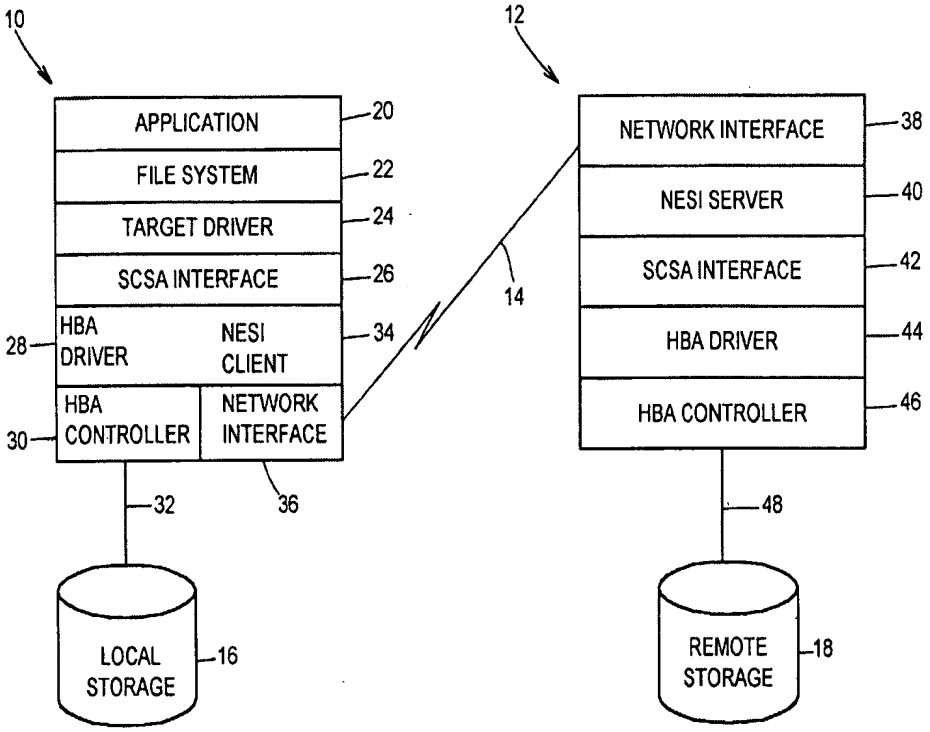


FIG. 1

U.S. Patent Nov. 23, 1999 Sheet 1 of 3 5,991,813

Zarrow discloses a system wherein a local computer 10 is attached to a local storage device 16, which is described as a conventional peripheral device such as a hard disk drive or tape device. (col. 2, lines 52-60; col. 1, lines 11-17). The system further includes a remote computer

12 and a remote storage device 18 coupled thereto. (col. 2, lines 55-57). The two computers 10 and 12 are, in a conventional fashion, connected together over a network 14. (col. 2, lines 54-55).

Zarrow teaches that communications between the computers and the types of peripheral devices disclosed therein generally follow one of the SCSI standards, but that those conventional standards have a significant drawback in that they can only be employed for communication between devices that are physically proximate. (col. 1, lines 11-23). As a result, Zarrow teaches that allowing a SCSI device to be accessed by more than one device over a network had been difficult, prior to the adoption of several new standards, including a Generalized Packet Protocol (GPP), which was designed for use over a wide-area network (WAN). (col. 1, lines 23-36.)

To use the GPP protocol, Zarrow suggests that interfaces needed to be developed for computers to efficiently access SCSI devices over a WAN, and teaches that it is preferable for any remote SCSI devices to be accessed in a manner similar to the access of local SCSI devices. (col. 1, lines 37-43). Thus, the focus of the Zarrow application is directed to a particular implementation for enabling the SCSI protocol to be used over a WAN so that a local computer 10 (Fig. 1) can access a remote peripheral device 18. One particular application for such a configuration is the implementation of a remote mirroring facility.

In Zarrow's host-based mirroring system, when writes are performed to the local storage device 16, the local host 10 also packetizes the write command and transmits it over the network 14 to the remote computer 12. The remote computer 12 then unpacketizes the command and issues the SCSI write command to the remote storage device 18. (col. 1, lines 60-67; col. 2, lines 10-15).

Thus, Zarrow is directed to host-based mirroring over a network between two host computers that conventionally communicate over networks, and have network interfaces 36 (Fig. 1) that enable such communication.

B. Yanai

Yanai, commonly assigned to EMC, is directed to the type of remote mirroring data facility disclosed in the background of the present application. Yanai specifically teaches away from the type of host-based mirroring system disclosed in Zarrow, indicating that such systems overly burden the host CPU with the task of writing data not only to its local storage system, but also to the remote (i.e., "secondary") storage system, which dramatically reduces system performance (at col. 2, lines 17-24). In contrast, Yanai teaches a system wherein mirroring communication is controlled directly by the storage systems. (see Abstract). As shown in Fig. 1 of Yanai, reproduced below, the system includes a host computer 12, a primary data storage system 14 and a secondary storage system 46 that is coupled to the primary storage system via a communication link 40. When data is written by the host computer 12 to the primary data storage system 14, it is mirrored to the secondary storage system automatically, "without intervention of a primary or secondary host computer and thus without affecting performance of a primary or secondary host computer system." (col. 2, lines 47-53).

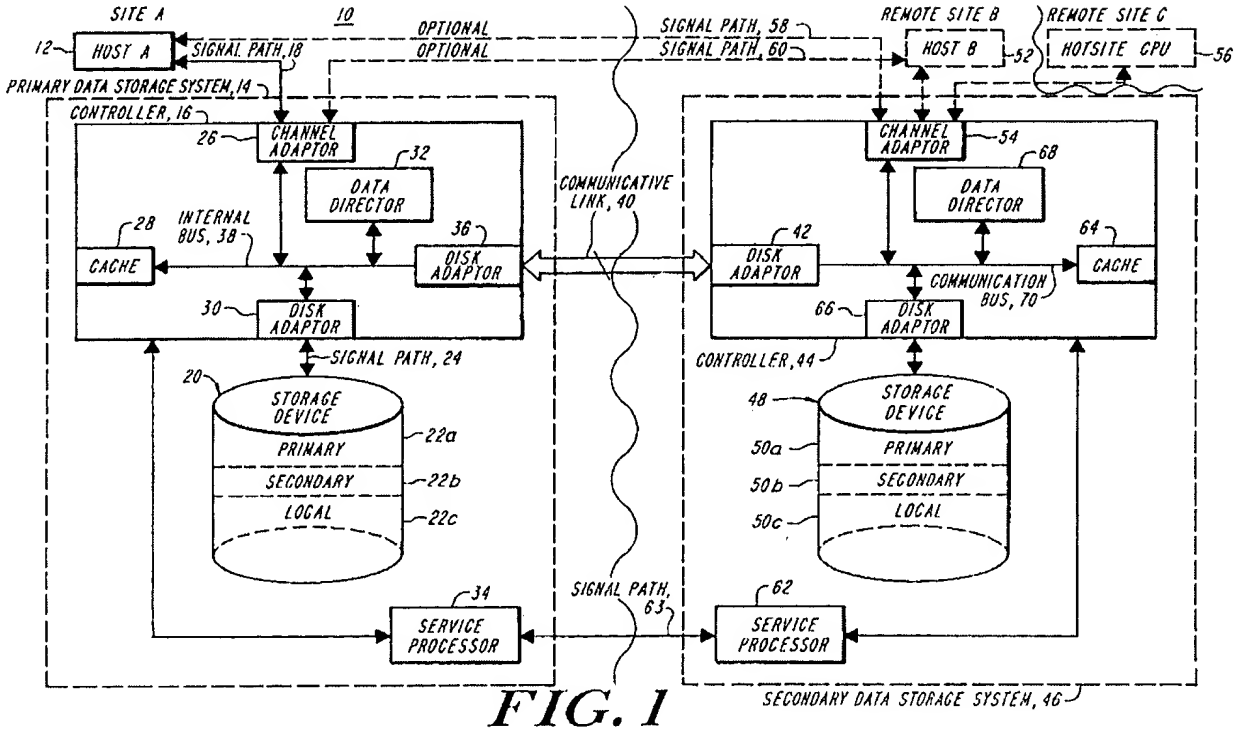


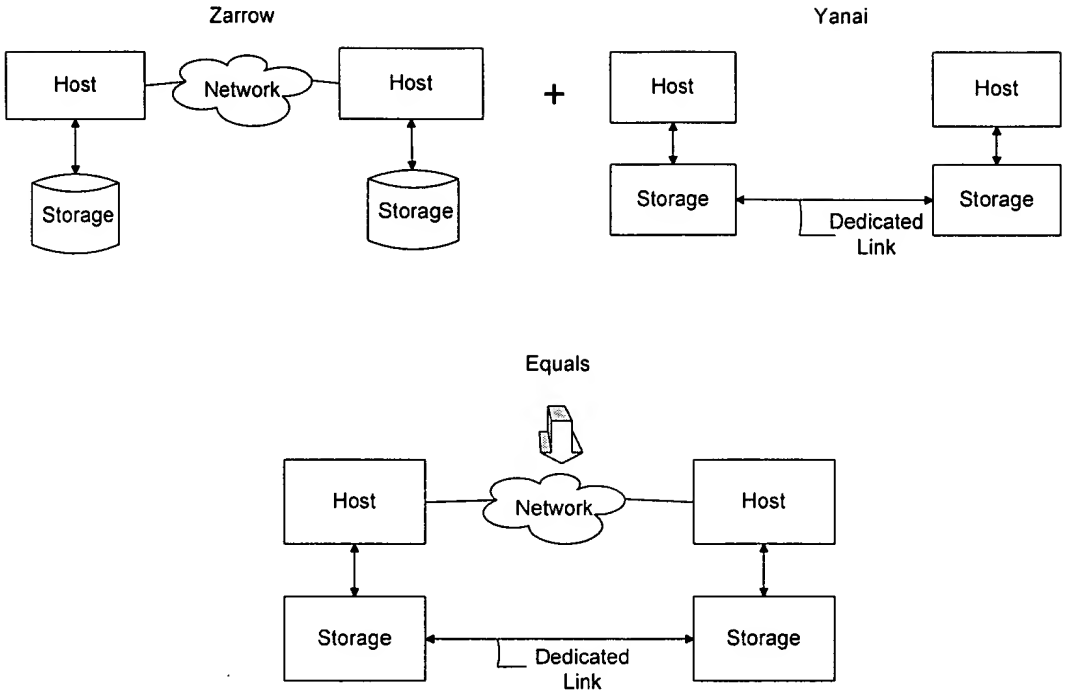
FIG. 1

Yanai specifically teaches that the communication link 40 between the primary and secondary storage systems should be a high speed point-to-point communication link (col. 2, line 55; col. 4, lines 54-62). The point-to-point communication link can be implemented with different types of physical connections and protocols, including an ESCON link, a fibre optic link, a T1/T3 telecommunication link and FDDI and SONET network connections.

C. The Combination of Zarrow and Yanai Would Yield A System Employing A Dedicated High Speed Point-to-Point Communication Link Between the Storage Systems

The final Office Action recognizes that Zarrow does not teach a remote mirroring system in which the communication link extends between the first and second storage systems, but notes that Yanai does teach such a system. (Office Action, pages 2-3). The final Office Action highlights Yanai's teaching that removing the host from the mirroring process increases system performance (Office Action, page 3), and concludes that one of ordinary skill in the art would have been motivated by the teachings of Yanai to modify Zarrow to achieve improved system performance. However, the final Office Action fails to explain what the resulting system would look like.

Appellants respectfully assert that, as shown in the figure below, if one of ordinary skill in the art were to modify the system of Zarrow based upon Yanai, the resulting system would be one in which the host computers would continue to communicate over a network connection, but wherein the storage systems would be connected via a dedicated high speed point-to-point communication link as specifically taught by Yanai. As discussed below, such a system does not render obvious any of Appellants' claims on appeal.



Following the logic set forth in the final Office Action, one of ordinary skill in the art would have been motivated by the teachings of Yanai to modify Zarrow so that Zarrow's technique for mirroring information between the local and remote storage systems (i.e., by passing information between the host computers 10 and 12 over the network 14) would be replaced. Specifically, the person of ordinary skill in the art would have been motivated by the teachings of Yanai to employ a mirroring scheme that does not pass through the host computers, but rather, enables direct communication between the storage devices. For instruction as to how this goal could be accomplished, the skilled artisan would have looked to the teachings of Yanai, which is the only prior art reference relied upon for teaching direct mirroring communication between storage systems. Thus, it is respectfully asserted that one of ordinary skill in the art motivated by Yanai to modify the system of Zarrow for the reasons suggested in the final Office Action would have been lead to a system wherein communication between the host computers could continue over the network 14, but wherein communication between the storage devices

would take place over a high speed point-to-point communication link as specifically taught by Yanai. (see e.g., col. 4, line 57).

In rejecting Appellants' claims under Issue 1 as being obvious over the combination of Zarrow and Yanai, the final Office Action concludes that one skilled in the art would have been led to employ a network cloud as the communication link between the storage systems to enable direct storage system to storage system mirroring communication. In doing so, it is respectfully asserted that the final Office Action goes beyond the fair teachings of the references and allows hindsight to enter into the analysis in reconstructing Appellants' claims. Neither Yanai, Zarrow nor any other prior art reference of record teaches or suggests direct mirroring communication between two storage devices over a communication link that includes a network cloud. The final Office Action points to no motivation in the prior art of record to make the further modification to the combined system of Yanai and Zarrow to replace the high speed point-to-point communication link that Yanai teaches should be employed for communicating between the two storage systems with a network cloud.

D. The Final Office Action Fails To Establish A Prima Facie Case Of Obviousness, As It Does Not Even Attempt To Explain The System That One Of Ordinary Skill In The Art Would Allegedly Have Arrived At Based Upon The Teachings Of The Prior Art

During the prosecution of this application, the Examiner graciously granted a telephone interview to discuss the rejection of the claims over the combination of Zarrow and Yanai. The Examiner indicated that she disagreed with Appellants' assessment that one following the teachings of Zarrow and Yanai would have been led to a system wherein the communication link between the storage systems would be a dedicated high speed point-to-point communication link. This prompted Appellants to question what system configuration the Examiner believed would have resulted from following the combined teachings of Zarrow and Yanai. The Examiner indicated that she had not gone through the analysis of determining what system configuration one of ordinary skill in the art would have arrived at, as the Examiner did not consider this to be

her burden in establishing a prima facie case of obviousness. Appellants respectfully assert that this is incorrect.

The Examiner's burden in setting forth a prima facie case of obviousness is set forth, for example, at MPEP §2142 (see page 2100-96), which states:

> To reach a proper determination under 35 U.S.C. 103, the Examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all of the factual information, the Examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. A tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Thus, the Examiner must essentially go through a three step process: (1) the claim must be considered to determine the relevant field of the prior art and conduct the search; (2) the claim language must then be disregarded and the Examiner must look only to the teachings of the prior art in reaching a legal conclusion as to what one of ordinary skill in the art would have been motivated to arrive at based upon the collective teachings of the prior art ("impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art"); and (3) the claim must then be considered again and compared against the combined teachings of the prior art to determine whether the claimed invention as a whole would have been obvious.

It is respectfully asserted that by failing to reach a conclusion as to what system configuration one of ordinary skill what have been led to based upon the teachings of Zarrow and Yanai, requirement (2) has not been met, as no conclusion was reached looking only to the teachings of the prior art. As indicated in the above-quoted portion of MPEP §2142, hindsight

can only be avoided by ignoring Appellants' disclosure and claims, and looking solely to the teachings of the prior art to determine what those teachings would suggest. Without having gone through the process of determining what system configuration would have resulted from the combined teachings of the prior art, the Examiner has impermissibly used the claim as a template to pick and choose certain isolated teachings of the references, without determining what the prior art teaches as a whole. See e.g., In re Fritch, 23 USPQ 2d 1780, 1784 (CAFC 1992) ("It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This Court has previously stated that '[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.'").

Here, the Examiner picks and chooses various features of Zarrow and Yanai in an attempt to reconstruct Appellants' claims in hindsight. To reconstruct Appellants' claims, the final Office Action "picks" the feature of Zarrow wherein mirroring communication is performed over a network, and "chooses" the feature of Yanai wherein mirroring communication is performed directly between the storage systems. This is simply improper. The failure to properly analyze what one of ordinary skill in the art would have been led to do based solely upon the teachings of the prior art makes clear that no prima facie case of obviousness has been established. In fact, as explained above, when a proper analysis is performed without using hindsight, it is clear that one of ordinary skill in the art would not have been led by the teachings of Zarrow and Yanai to perform mirroring communication directly between two storage systems over a network cloud.

E. The Record Makes Clear That Specific Teachings Of Yanai Have Been Ignored, Such That The Reference Has Impermissibly Not Been Considered In Its Entirety

Appellants' position consistently has been that the teachings of the prior art would not have led one to the claimed invention, as the resulting system would have employed a dedicated

high speed point-to-point communication link between the storage systems, as that is what Yanai teaches. The final Office Action asserts that Yanai was relied upon only:

> ... for the specific teaching of coupling a secondary storage system to a host CPU via a primary storage system and not for using a point to point communication link. Therefore, motivation to replace the direct point-to-point communication link in Yanai's system is not provided as this feature was not relied upon. (final Office Action, page 17).

Appellants respectfully assert that this quote makes clear that specific teachings in Yanai were ignored and the reference was not considered as a whole, which is impermissible. (See e.g., MPEP §2142.02 at page 2100-95) ("A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.").

The Federal Circuit and its predecessor court have repeatedly indicated that when performing an obviousness analysis under §103, each reference must be considered in its entirety to determine whether it fairly suggests that the invention as a whole is obvious. See e.g., Bausch & Lomb v. Barnes-Hind/Hydrocurve, 230 USPQ 416, 419 (Fed. Cir. 1986) ("it is impermissible within the framework of §103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art."); In re Dow Chemical Co., 5 USPQ 2d 1529, 1531-1532 (Fed. Cir. 1988) (when determining whether a suggestion for the claimed invention can be found in the prior art, "the full field of the invention must be considered; for the person or ordinary skill is charged with knowledge of the entire body of technical literature, including that which might lead away from the claimed invention ... Evidence that supports, rather than negates, patentability must be fairly considered.") (emphasis added); W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303, 311 (noting that the District Court erred in its §103 analysis "in considering the references in less than their entireties, i.e., in disregarding disclosures in the references that diverge from and teach away from the invention at hand."); In re Kuderna and Phillips, 165 USPQ 575, 578-579 (CCPA 1970) (stating that the issue of what

would have been obvious to one of ordinary skill in the art must be made "in view of the *sum* of all the relevant teachings in the art, not in view of first one and then another of isolated teachings in the art."); In re Wesslau, 147 USPQ 391, 393 (CCPA 1965) (reversing the Board's decision and noting that if one were to follow the teachings of the prior art reference "in its entirety", he would be led away from the Applicants' invention).

The only teaching provided in the prior art of record for direct communication between two storage systems is Yanai's teaching that a point-to-point communication link be employed. The Examiner has ignored this teaching of Yanai. It is impermissible for the Examiner to rely upon one portion of Yanai without considering the reference as a whole. When considered in its entirety, Yanai teaches away from the claimed invention by specifically teaching that the communication link between the storage systems be a dedicated high speed point-to-point communication link.

The final Office Action asserts that Appellants have argued that "anyone using Yanai's teachings would have only known to use a point-to-point communication link" and indicates that the Examiner disagrees. (final Office Action, page 18). That mischaracterizes Appellants' argument. What Appellants have argued is that Yanai specifically teaches the use of a point-to-point communication link, and nothing more. The Examiner has not cited any prior art reference that suggests modifying Yanai's point-to-point communication link for any reason.

The final Office Action asserts that one of ordinary skill in the art would have known that Yanai's point-to-point communication link could be replaced with other types of links. (final Office Action, page 18). However, the final Office Action does not point to any motivation whatsoever in any prior art reference of record for making such a modification to the Yanai system. References can only be modified under §103 where there is some motivation in the prior art for making the modification. (MPEP §2143.01). Here, the prior art of record is devoid of any such motivation. Thus, it is respectfully asserted that no prima facie case of obviousness has been established.

As seen from the foregoing, a rejection under §103 requires that the Examiner (1) look only to the teachings of the prior art; and (2) consider all of the teachings of the prior art in their entirety in making a determination as to whether the prior art renders the claim as a whole obvious. Here, the clear teachings of the prior art are to perform storage to storage communication over a dedicated high speed point-to-point communication link as taught by Yanai. It is impermissible for the Examiner to disregard Yanai's specific teaching in this regard. In addition, to the extent that the rejection is based on the assertion that one of ordinary skill in the art would have been motivated to modify the point-to-point communication link of Yanai, there is simply nothing in the prior art of record to provide such a motivation. Therefore, it is respectfully asserted that no prima facie case of obviousness has been established.

F. Other Factors Teach Away From The Present Invention

In addition to there being no teaching in any of the prior art references to perform direct mirroring between two storage systems over a network, several suggestions in the prior art taught away from such a configuration. First, to the extent the final Office Action is suggesting that storage devices of the type disclosed in Zarrow should be connected to a network, such storage devices are not intelligent devices that would have a network interface that would enable them to communicate over a network. Second, it was generally understood in the art (see Yanai, col. 2, line 55 and col. 4, line 57; and Ohran at col. 4, line 38) that the communication link for remote mirroring must be a high speed communication link. A network link that is shared by other resources would simply not provide the same performance as a dedicated high speed communication link. For these additional reasons, it is respectfully asserted that the prior art of record teaches away from performing direct mirroring between two storage systems over a network connection.

G. Claims 1-3, 5, 10-12 and 18-19

Claim 1 is directed to a computer system that includes, *inter alia*, a CPU, first and second storage systems, a mirroring controller that mirrors at least some of the information written from the CPU to the first storage system to the second storage system, and at least one communication link including a network cloud that extends between the first and second storage systems.

For the reasons discussed above, it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to claim 1, as it does not explain how one following the teachings of Zarrow and Yanai would arrive at a system including first and second storage systems and a communication link including a network cloud extending between them. Therefore, it is respectfully asserted that the rejection of claim 1, as well as claims 2-3, 5, 10-12 and 18-19 that depend therefrom, under 35 U.S.C. §103 as being obvious over Zarrow in view of Yanai is improper and should be reversed.

H. Claims 39-41 and 46

Claim 39 is directed to a method of mirroring information in a computer system including first and second storage systems and at least one communication link that extends therebetween and includes a network cloud. The method comprises a step of, in response to information being written from a CPU to the first storage system, transmitting at least some of the information into the network cloud from the first storage system with the second storage system designated as a destination.

For the reasons discussed above, the final Office Action fails to set forth a prima facie case of obviousness with respect to claim 39, as it does not explain how one of ordinary skill in the art following the teachings of Zarrow and Yanai would arrive at a method of mirroring information from a first storage system to a second storage system by transmitting the information into a network cloud as recited in claim 39. Therefore, it is respectfully asserted that the rejection of claim 39, as well as claims 40-41 and 46 that depend therefrom, is improper and should be reversed.

I. Claims 47-49 and 51-52

Claim 47 is directed to a computer system capable of mirroring information in a remotely disposed target storage system coupled to the computer system via at least one communication link that includes a network cloud. The computer system includes, *inter alia*, a source storage system and a controller, responsive to information written from the CPU to the source storage system, to transfer at least some of the information into the network cloud so that it can be mirrored in the target storage system.

For the reasons discussed above, it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to claim 47, as it does not explain how one of ordinary skill in the art following the teachings of Zarrow and Yanai would arrive at a source storage system capable of mirroring information to a remotely disposed target system via a communication link including a network cloud. Thus, it is respectfully asserted that the rejection of claim 47, as well as claims 48-49 and 51-52 that depend therefrom, is improper and should be reversed.

2. Claims 4 and 17 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Black

Claims 4 and 17 depend from claim 1. As explained in the preceding section (VII(1)), the rejection of claim 1 is improper and should be reversed, as the prior art of record does not teach or suggest a computer system with a communication link including a network cloud extending between first and second storage systems. Black does not cure this deficiency in the combination of Zarrow and Yanai. Therefore, claims 4 and 17 patentably distinguish over the prior art of record for at least the same reasons as claim 1, and it is respectfully asserted that the rejection of these claims should be reversed.

3. Claims 6-8, 15-16, 20-21, 42-44 and 50 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Vishlitzky

Each of these claims depends from one of claims 1, 39 and 47, and is patentable over the prior art of record for at least the same reasons as the independent claim from which it depends. In this respect, Vishlitzky does not cure the defects in the combination of Zarrow and Yanai discussed above in section VII(1), as Vishlitzky does not teach remote mirroring communication between two storage systems over a network cloud. Thus, it is respectfully asserted that the rejection of these dependent claims under §103 should be reversed for at least the reasons set forth above in section VII(1).

Each of these dependent claims also further patentably distinguishes over the prior art, and is separately patentable from the claims discussed in section VII(1). Each is directed to a system or method that employs a plurality of communication paths to or from the network cloud, so that information can be transferred in parallel through the network cloud. None of the prior art references of record teach or suggest employing a plurality of paths for coupling to a network cloud. In this respect, the reference relied upon in the final Office Action for teaching this feature (i.e., the commonly assigned Vishlitzky patent) teaches multiple parallel paths, but not in connection with the use of a network cloud. It should be appreciated that the use of separate parallel paths of direct point-to-point communication links would be readily recognized to provide performance improvements. However, this provides no teaching or suggestion for the use of multiple paths for coupling to a network cloud, which does not employ dedicated point-to-point communication links, such that performance improvements would be less recognizable. In short, the prior art of record simply does not teach or suggest multiple paths for connecting to a network cloud in a remote mirroring data facility. Therefore, claims 6-8, 15-16, 20-21, 42-40 and 50 patentably distinguish over the prior art of record, and are separately patentable over the claims from which they depend for this additional reason.

4. Claims 9 and 14 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Sparks

Claims 9 and 14 depend from claim 1 and are patentable for at least the same reasons. In this respect, the Sparks reference does not address the deficiencies in Zarrow and Yanai in failing to render obvious the system recited in claim 1, from which claims 9 and 14 depend. Thus, it is respectfully asserted that the rejection of claims 9 and 14 should be reversed for at least the same reasons discussed above in connection with claim 1.

Furthermore, each of claims 9 and 14 recites the communication link extending between the first and second storage systems as including at least one wireless connection. Thus, these claims further distinguish over the prior art of record, and are separately patentable over claim 1, for this additional reason.

Sparks is relied upon for suggesting a wireless connection in a "backup/mirroring system." (final Office Action, page 6). The assumption made in the final Office Action - that backup and mirroring systems are essentially identical - is unsupported in the prior art of record, and simply incorrect. In a backup system such as that disclosed in Sparks, the backup operation is typically performed off-line, such that the source storage system is made unavailable for additional updates. Conversely, in a mirroring system such as that disclosed in Yanai, the source storage system is not taken off-line, and mirroring updates are made in essentially real time.

In view of the foregoing differences between the backup system of Sparks and the mirroring system of Yanai, it is respectfully asserted that one of ordinary skill in the art would not have been motivated by the teachings of Sparks to modify the high speed point-to-point dedicated communication link taught by Yanai for implementing direct communication between two storage devices. In this respect, such direct communication is not conventional, and it is critical to ensure the integrity and performance of the link. As Yanai is the only prior art reference relied upon for teaching direct communication between two storage systems, it is respectfully asserted that none of the prior art references (such as Sparks) that teach the use of

different types of communication links in entirely different applications would have motivated one of ordinary skill in the art to modify the dedicated high speed communication link taught by Yanai.

For the reasons stated above, it is respectfully asserted that claims 9 and 14 further distinguish over the prior art of record, and are separately patentable from independent claim 1 from which they depend.

5. Claims 13 and 45 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Sparks

Claims 13 and 45 depend, respectively, from claims 1 and 39, and are patentable over the prior art for at least the same reasons. In this respect, Sparks does not remedy the deficiency in Zarrow and Yanai in connection with independent claims 1 and 39. Therefore, it is respectfully asserted that the rejection of claims 13 and 45 should be reversed, for at least the reasons discussed above in connection with the claims from which they depend.

Furthermore, claims 13 and 45 further distinguish over the prior art of record and are separately patentable from the claims from which they depend. In this respect, each of claims 13 and 45 is directed to a computer system, or a method of mirroring information in such a system, that includes a third storage system coupled to the first storage system via the at least one communication link so that information can be mirrored in both second and third storage systems.

The prior art of record does not teach or suggest any mirroring system that mirrors information written to a first storage system in second and third storage systems. The final Office Action relies upon Sparks for such a teaching, but as discussed above, Sparks is directed to a backup system, rather than a mirroring system. As recognized in Ohran and Yanai, the generally held belief in the art was that the performance of a mirroring system was critical. Thus, the fact that multiple backup tapes might be made in parallel in an off-line backup system would not have lead one of ordinary skill in the art to employ multiple storage systems in a mirroring system.

In view of the foregoing, claims 13 and 45 further distinguish over the prior art of record, and are separately patentable over the independent claims from which they depend. The rejection of these claims should be reversed for these additional reasons.

6. Claims 22-30 and 53-55 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Sparks and Yanai

A. Claims 22-30

Claim 22 is directed to a computer system that includes first and second storage systems, a mirroring controller, and at least one communication link extending between the first and second storage systems and including at least one wireless connection.

The final Office Action alleges that one of ordinary skill in the art would have been motivated to modify the network 14 between the computers 10, 12 of Zarrow to employ a wireless communication link between these computers based upon the teachings of Sparks (final Office Action, pgs. 7-8). Even if this conclusion is assumed to be correct, the resulting system would still suffer from the same deficiency of Zarrow, in that mirroring communication from one storage device to the other would take place via the computers 10, 12. If the Zarrow/Sparks system were to be further modified as suggested in the final Office Action to enable direct mirroring communication between the storage devices, one of ordinary skill in the art would have been led to employ Yanai's direct point-to-point high speed communication link 40 for achieving this result, as Yanai is the only prior art reference relied upon for teaching direct mirroring communication between two storage devices. Such a system would not meet the limitations of claim 22, wherein the wireless communication link extends between the storage systems. Therefore, it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to claim 22, as well as claims 23-30 that depend therefrom, such that the rejection of these claims under §103 should be reversed.

Although the final Office Action does not set forth this analysis, Appellants further point out that one or ordinary skill in the art would not have been motivated by Sparks, or any other prior reference of record, to replace the dedicated point-to-point communication link of Yanai

with a wireless connection. As discussed above, mirroring communication between a pair of storage devices is not common, and there is simply nothing in the backup system of Sparks which would have suggested to one of ordinary skill in the art to modify the application-specific system of Yanai to replace the communication link disclosed therein with a wireless connection in a mirroring (not a backup) system.

Claim 23 further distinguishes over the prior art of record, and is separately patentable from claim 22, because claim 23 recites the at least one communication link as including a network cloud. As discussed above in connection in section VII(1), this feature of the present invention is not taught or suggested by the prior art of record. Thus, claim 23 further distinguishes over the prior art of record, and is separately patentable over claim 22, for this additional reason.

B. Claims 53-55

Claim 53 is directed to a computer system capable of mirroring information in a remotely disposed target storage system that is coupled to the computer system via at least one communication link that includes at least one wireless connection. The computer system comprises a CPU, a source storage system to be coupled to the at least one communication link so that the at least one communication link extends between the source and target storage systems, and a controller, responsive to information being written from the CPU to the source storage system, to transfer at least some of that information into the at least one communication link so that it can be mirrored in the target storage system. As discussed above in connection with claim 22, the combination of Zarrow, Sparks and Yanai does not teach a computer system that includes a source storage system to be coupled to a communication link so that a communication link extends between the source storage system and a target storage system. Thus, for the reasons stated above, it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to claim 53, as well as claims 54-55 that depend therefrom, such that the rejection of these claims under §103 should be reversed.

7. Claims 31-32 and 35-38 Are Not Obvious
Under 35 U.S.C. §103 Over Zarrow in View of Sparks and Yanai

A. Claims 31-32 and 35-36

Claims 31-32 and 35-36 are directed to a computer system including first, second and third storage systems, a mirroring controller, a second communication link that extends between the first and second storage systems and a third communication link that extends between the first and third storage systems, wherein the second and third communication links each comprises a network cloud.

As discussed above in section VII(1), the combination of Yanai and Zarrow does not teach a computer system including a communication link that extends between two storage systems and comprises a network cloud. Sparks does not remedy this deficiency. Therefore, for the reasons discussed above in connection with Issue 1, it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to independent claim 31. Therefore, it is respectfully asserted that the rejection of claim 31, as well as claims 32 and 35-36 that depend therefrom, is improper and should be reversed.

In addition, claim 31 further distinguishes over the prior art, and is separately patentable from the claims rejected over the combination of only Zarrow and Yanai in Issue 1, because the prior art of record does not teach or suggest a computer system that includes a mirroring controller to mirror information to both second and third storage systems. As discussed above in connection with the claims rejected under Issue 5, the reference in Sparks to performing a backup operation to multiple backup devices would not have motivated one of ordinary skill in the art to modify the mirroring system of Yanai to perform a mirroring operation to multiple storage systems. Thus, claims 31-32 and 35-36 further distinguish over the prior art for this additional reason.

B. Claims 37-38

Independent claim 37 is directed to a method of operating a computer system that includes first, second and third storage systems, a second communication link extending between

the first and second storage systems and a third communication link extending between the first and third storage systems, wherein each of the first and second communication links is formed through a network cloud. The method includes a step of, in response to information being written to the first storage system, mirroring at least some of the information in both the second and third storage systems by transferring the information through the network cloud.

As should be appreciated from the discussion above in connection with claim 31, the prior art of record does not teach or suggest such a method. Therefore, it is respectfully asserted that the rejection of claim 37, and claim 38 that depends therefrom, is improper and should be reversed.

8. Claim 34 Is Not Obvious Under 35 U.S.C. §103 Over Zarrow, Yanai, Sparks and Black

Claim 34 depends from 31 and is patentable over the prior art of record for at least the same reasons. Therefore, for the reasons discussed above in section VII(1) in connection with claim 31, it is respectfully asserted that the rejection of claim 34 is improper and should be reversed.

9. Claims 56-58 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Staheli

Claims 56-68 are directed to a computer system that includes, *inter alia*, first and second storage systems, a mirroring controller, and at least one communication link that extends between the first and second storage systems and is selected from the group consisting of an intranet and the Internet.

The rejection of claims 56-58 is on essentially the same grounds as the rejections under Issue 1, with Staheli apparently[6] being relied upon solely for the teaching that a network can be used to form an intranet. As discussed above in section VII(1), one of ordinary skill in the art

[6] The final Office Action does not discuss how Staheli is relied upon in the rejection.

following the teachings of Zarrow and Yanai would not have been led to employ a computer system having a communication link that extends between first and second storage systems and comprises any type of network (e.g., an intranet or the Internet), as one of ordinary skill in the art would have been led to employ the dedicated high speed point-to-point communication link 40 taught by Yanai for this purpose. Therefore, it is respectfully asserted that the rejection of claims 56-58 under 35 U.S.C. §103 as being obvious over Zarrow in view of Yanai and Staheli is improper, and should be reversed.

10. Claims 59-60 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Black

Claims 59-60 are directed to a computer system comprising first and second storage systems, a mirroring controller, and at least one communication link extending between the first and second storage systems, the at least one communication link being selected from the group consisting of a packet switched network and a cell switched network.

As discussed above, the combination of Zarrow and Yanai fails to teach a computer system having a communication link extending between first and second storage systems and including a network. Black does not solve this deficiency in the two primary references, as Black is only relied upon for teaching particular types of networks. Therefore, for the reasons discussed above in section VII(1), it is respectfully asserted that the final Office Action fails to set forth a prima facie case of obviousness with respect to claims 59-60, such that the rejection of these claims under §103 as being obvious over Zarrow in view of Yanai and Black should be reversed.

11. Claims 62-63 and 65-67 Are Not Obvious Under 35 U.S.C. §103 Over Zarrow in View of Yanai and Vishlitzky

Each of claims 62-63 and 65-67 is directed to a computer system, or a method of mirroring information in such a system, that employs first and second storage systems and at

least one communication link extending therebetween. The at least one communication link includes a network cloud and a plurality of communication paths into the network cloud, so that information can be transferred in parallel through the network cloud.

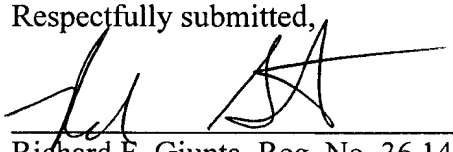
As discussed above in section VII(1), the primary references of Zarrow and Yanai do not teach or suggest a computer system, or a method of mirroring information in such a computer system, including first and second storage systems and a communication link extending therebetween that includes a network cloud. Vishlitizky does not solve this deficiency in the combination of Zarrow and Yanai. Therefore, for the reasons discussed above in section VII(1), it is respectfully asserted that the final Office Action fails to set forth the prima facie case of obviousness with respect to claims 62-63 and 65-67, so that the rejection of these claims should be reversed.

Furthermore, as discussed above in section VII(3), the prior art of record does not teach or suggest the use of multiple paths for connection of the storage systems to a network cloud. Therefore, claims 62-63 and 65-67 further patentably distinguish over the prior art of record for this additional reason.

VIII. CONCLUSION

For the foregoing reasons, the rejections of claims 1-32, 34-60, 62-63 and 65-67 under 35 U.S.C. §103 are improper and should be reversed.

Respectfully submitted,



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APPENDIX A – CLAIMS AS PENDING

1. A computer system comprising:

a central processing unit (CPU);

a first storage system that is coupled to the CPU to store information written from the CPU;

a second storage system;

at least one communication link coupling the second storage system to the CPU, the at least one communication link including a network cloud that is shared with at least one other resource so that no portion of the network cloud is dedicated exclusively to transferring information between the CPU and the second storage system, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in the second storage system by transferring the at least some of the information through the network cloud.

2. The computer system of claim 1, wherein the network cloud includes the Internet, so that the network cloud is publicly accessible.

3. The computer system of claim 1, wherein the network cloud comprises an intranet.

4. The computer system of claim 1, wherein the at least one communication link is one of a packet switched network and a cell switched network.

5. The computer system of claim 1, wherein the CPU includes means for communicating with the at least one other resource via the network cloud.

6. The computer system of claim 1, wherein the at least one communication link includes a plurality of communication paths from the CPU to the network cloud, so that a plurality of packets of information can be transferred from the CPU to the second storage system in parallel through the network cloud.

7. The computer system of claim 6, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

8. The computer system of claim 1, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage

system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

9. The computer system of claim 1, wherein the at least one communication link includes at least one wireless connection.

10. The computer system of claim 1, wherein the mirroring controller is distributed between the first and second storage systems.

11. The computer system of claim 10, wherein the mirroring controller includes means, distributed between the first and second storage systems, for mirroring the at least some of the information written from the CPU to the first storage system in the second storage system.

12. The computer system of claim 11, wherein the CPU is a first CPU, and wherein the system further includes a second CPU coupled to the second storage system.

13. The computer system of claim 1, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system, and wherein the computer system further includes:

a third storage system coupled to the first storage system via the at least one communication link so that the CPU can store information in the third storage system via the first storage system; and

wherein the mirroring controller includes means, distributed between the first, second and third storage systems, for mirroring the at least some of the information written from the CPU to the first storage system in both of the second and third storage systems.

14. The computer system of claim 11, wherein the at least one communication link includes at least one wireless connection.

15. The computer system of claim 11, wherein the at least one communication link includes a plurality of communication paths from the CPU to the network cloud, so that a plurality of packets of information can be transferred from the CPU to the second storage system in parallel through the network cloud.

16. The computer system of claim 15, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

17. The computer system of claim 11, wherein the at least one communication link is one of a packet switched network and a cell switched network.

18. The computer system of claim 11, wherein the network cloud comprises an intranet.

19. The computer system of claim 11, wherein the network cloud includes the Internet, so that the network cloud is publicly accessible.

20. The computer system of claim 2, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

21. The computer system of claim 3, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

22. A computer system comprising:

a central processing unit (CPU);

a first storage system that is coupled to the CPU to store information written from the CPU;

a second storage system;

at least one communication link coupling the second storage system to the CPU, the at least one communication link including at least one wireless connection, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in the second storage system by transferring the at least some of the information over the at least one communication link.

23. The computer system of claim 22, wherein the at least one communication link includes a network cloud that comprises an intranet shared by at least one other resource.

24. The computer system of claim 22, wherein the mirroring controller is distributed between the first and second storage systems.

25. The computer system of claim 24, wherein the mirroring controller includes means, distributed between the first and second storage systems, for mirroring the at least some of the information stored in the first storage system in the second storage system.

26. The computer system of claim 25, wherein the CPU is a first CPU, and wherein the system further includes a second CPU coupled to the second storage system.

27. The computer system of claim 25, wherein the at least one wireless connection is formed via a satellite communication system.

28. The computer system of claim 25, wherein the at least one wireless connection is formed via a microwave communication system.

29. The computer system of claim 22, wherein the at least one wireless connection is formed via a satellite communication system.

30. The computer system of claim 22, wherein the at least one wireless connection is formed via a microwave communication system.

31. A computer system comprising:

a central processing unit (CPU);

a first communication link;

a first storage system coupled to the CPU via the first communication link to store information written from the CPU;

a second storage system;

a second communication link coupling the second storage system to the CPU, wherein the second communication link extends between the first and second storage systems so that the second storage system is coupled to the CPU via the first storage system;

a third storage system;

a third communication link coupling the third storage system to the CPU, wherein the third communication link extends between the first and third storage systems so that the third storage system is coupled to the CPU via the first storage system; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in both the second and third storage systems;

wherein the second and third communication links each comprises a network cloud that is shared by the first, second and third storage systems.

32. The computer system of claim 31, wherein the mirroring controller is distributed between the first, second and third storage systems.

34. The computer system of claim 31, wherein at least one of the second and third communication links is one of a packet switched network and a cell switched network.

35. The computer system of claim 31, further including means for multicasting the at least some of the information stored by the CPU in the first storage device to the second and third storage systems.

36. The computer system of claim 31, wherein the mirroring controller is distributed between the first and second storage systems.

37. A method of operating a computer system that includes a central processing unit (CPU), a first communication link, a first storage system coupled to the CPU via the first communication link to store information written from the CPU, a second storage system, a second communication link coupling the second storage system to the CPU and extending between the first and second storage systems so that the second storage system is coupled to the CPU via the first storage system, a third storage system, and a third communication link coupling the third storage system to the CPU and extending between the first and third storage systems so that the third storage system is coupled to the CPU via the first storage system, wherein each of the second and third communication links is formed through a network cloud that is shared by the first, second and third storage systems, the method comprising a step of:

(A) in response to the information being written from the CPU to the first storage system, mirroring at least some of the information written from the CPU to the first storage system in both the second and third storage systems by transferring the at least some of the information over the second and third communication links through the network cloud.

38. The method of claim 37, wherein step (A) includes a step of:

multicasting the at least some of the information stored by the CPU in the first storage device to the second and third storage systems over the network cloud.

39. A method of mirroring information stored in a computer system comprising a central processing unit (CPU), a first storage system that is coupled to the CPU to store information written from the CPU, and a second storage system coupled to the CPU by at least one communication link, the at least one communication link including a network cloud that is shared with at least one other resource so that no portion of the network cloud is dedicated exclusively to coupling the second storage system to the CPU, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system, the method comprising a step of:

A) in response to the information being written from the CPU to the first storage system, transmitting, from the first storage system, into the network cloud at least some of the information written from the CPU to the first storage system with the second storage system designated as a destination for the at least some of the information, so that the at least some of the information can be transferred through the network cloud and mirrored in the second storage system.

40. The method of claim 39, wherein the network cloud includes the Internet, and wherein step (A) includes a step of transmitting the at least some of the information into the Internet.

41. The method of claim 39, wherein the network cloud includes an intranet, and wherein step (A) includes a step of transmitting the at least some of the information into the intranet.

42. The method of claim 39, wherein the CPU is coupled to the network cloud through a plurality of communication paths; and

wherein step (A) includes a step of transmitting a plurality of packets of the at least some of the information in parallel from the CPU to the network cloud.

43. The method of claim 42, wherein the second storage system is coupled to the network cloud through a plurality of communication paths; and

wherein step (A) includes a step of transferring a plurality of packets of the at least some of the information in parallel from the network cloud to the second storage system.

44. The method of claim 39, wherein the second storage system is coupled to the network cloud through a plurality of communication paths; and

wherein step (A) includes a step of transferring a plurality of packets of the at least some of the information in parallel from the network cloud to the second storage system.

45. The method of claim 39, wherein the computer system further includes a third storage system coupled to the CPU through the network cloud, and wherein the method further comprises a step of transmitting at least some of the information stored by the CPU in the first storage system into the network cloud with the third storage system designated as a destination for the at least some of the information, so that the at least some of the information can be transferred through the network cloud and mirrored in both the second and third storage systems.

46. The method of claim 39, further comprising a step of:

(B) storing the at least some of the information transferred through the network cloud in the second storage system.

47. A computer system capable of mirroring information in a remotely disposed target storage system that is coupled to the computer system via at least one communication link that includes a network cloud that is shared with at least one other resource, the computer system comprising:

a central processing unit (CPU) coupled to the network cloud;

a source storage system that is coupled to the CPU to store information written from the CPU, the source storage system to be coupled to the at least one communication link so that the

at least one communication link extends between the source and target storage systems such that the CPU is coupled to the network cloud via the source storage system; and

a controller, responsive to the information being written from the CPU to the source storage system, to transfer at least some of the information written from the CPU into the network cloud so that the at least some of the information can be mirrored in the target storage system.

48. The computer system of claim 47, wherein the network cloud includes the Internet, so that the network cloud is publicly accessible.

49. The computer system of claim 47, wherein the network cloud comprises an intranet.

50. The computer system of claim 47, wherein the CPU is coupled to the network cloud through a plurality of communication paths so that a plurality of packets of information can be transferred from the CPU to the target storage system in parallel through the network cloud.

51. The computer system of claim 47, wherein the source storage system comprises the controller.

52. The computer system of claim 51, wherein the controller includes means, distributed between the source and target storage systems, for mirroring the at least some of the information stored in the source storage system in the target storage system.

53. A computer system capable of mirroring information in a remotely disposed target storage system that is coupled to the computer system via at least one communication link that includes at least one wireless connection, the computer system comprising:

a central processing unit (CPU) coupled to the at least one communication link;

a source storage system that is coupled to the CPU to store information written from the CPU, the source storage system to be coupled to the at least one communication link so that the at least one communication link extends between the source and target storage systems such that the CPU is coupled to the at least one communication link via the source storage system; and

a controller, responsive to the information being written from the CPU to the source storage system, to transfer at least some of the information written from the CPU into the at least one communication link so that the at least some of the information can be mirrored in the target storage system.

54. The computer system of claim 53, wherein the at least one wireless connection is formed via a satellite communication system.

55. The computer system of claim 53, wherein the at least one wireless connection is formed via a microwave communication system.

56. A computer system comprising:

a central processing unit (CPU);

a first storage system that is coupled to the CPU to store information written from the CPU;

a second storage system;

at least one communication link coupling the second storage system to the CPU so that the CPU can store information in the second storage system, the at least one communication link being selected from the group consisting of an intranet and the Internet, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in the second storage system by transferring the at least some of the information over the at least one communication link.

57. The computer system of claim 56, wherein the mirroring controller is distributed between the first and second storage systems.

58. The computer system of claim 57, wherein the mirroring controller includes means, distributed between the first and second storage systems, for mirroring the at least some of the information stored in the first storage system in the second storage system.

59. A computer system comprising:

a central processing unit (CPU);

a first storage system that is coupled to the CPU to store information written from the CPU;

a second storage system;

at least one communication link coupling the second storage system to the CPU so that the CPU can store information in the second storage system, the at least one communication link being selected from the group consisting of a packet switched network and a cell switched network, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in the second storage system by transferring the at least some of the information over the at least one communication link.

60. The computer system of claim 59, wherein the mirroring controller is distributed between the first and second storage systems.

62. A computer system comprising:

a central processing unit (CPU);

a first storage system that is coupled to the CPU to store information written from the CPU;

a second storage system;

at least one communication link coupling the second storage system to the CPU, the at least one communication link including a network cloud that is shared with at least one other resource so that no portion of the network cloud is dedicated exclusively to transferring information between the CPU and the second storage system, wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system, and wherein the at least one communication link includes a plurality of communication paths from the CPU to the network cloud, so that a plurality of packets of the information can be transferred from the CPU to the second storage system in parallel through the network cloud; and

a mirroring controller, responsive to the information being written from the CPU to the first storage system, to mirror at least some of the information written from the CPU to the first storage system in the second storage system by transferring the at least some of the information through the network cloud.

63. The computer system of claim 62, wherein the at least one communication link includes a plurality of communication paths from the network cloud to the second storage system, so that a plurality of packets of information can be transferred in parallel from the network cloud to the second storage system.

65. A method of mirroring information stored in a computer system comprising a central processing unit (CPU), a first storage system that is coupled to the CPU to store information written from the CPU, and a second storage system coupled to the CPU by at least one communication link, the at least one communication link including a network cloud that is shared with at least one other resource so that no portion of the network cloud is dedicated exclusively to coupling the second storage system to the CPU, and wherein the at least one communication link extends between the first and second storage systems such that the second storage system is coupled to the CPU via the first storage system, the method comprising a step of:

A) in response to the information being written from the CPU to the first storage system, transmitting at least some of the information written from the CPU to the first storage system over at least two parallel paths into the network cloud with the second storage system designated as a destination for the at least some of the information, so that the at least some of the information can be transferred through the network cloud and mirrored in the second storage system.

66. A computer system capable of mirroring information in a remotely disposed target storage system that is coupled to the computer system via at least one communication link that includes a network cloud that is shared with at least one other resource, the computer system comprising:

a central processing unit (CPU) coupled to the network cloud; and

a source storage system that is coupled to the CPU to store information written from the CPU;

wherein the source storage system includes a controller, responsive to the information being written from the CPU to the source storage system, to transfer at least some of the information written from the CPU from the source storage system into the network cloud so that the at least some of the information can be mirrored in the target storage system, wherein the source storage system is coupled to the network cloud through a plurality of communication paths so that a plurality of packets of the information can be transferred from the source storage system to the target storage system in parallel through the network cloud.

67. The computer system of claim 62, wherein the mirroring controller is distributed between the first and second storage systems.